

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/017929

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl.⁷ H03H9/25, 9/145

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl.⁷ H03H3/08-3/10, 9/145, 9/25, 9/42-9/44, 9/64, 9/68, 9/72, 9/76

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2004
Kokai Jitsuyo Shinan Koho 1971-2004 Jitsuyo Shinan Toroku Koho 1996-2004

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
JOIS on the web, [s KYOKAIIHA]

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 1998/052279 A1 (Hitachi, Ltd.), 19 November, 1998 (19.11.98), Pages 2 to 3, 6 to 13; Figs. 2, 4 to 6, 12 (Family: none)	1-9, 13-21
Y	JP 7-283688 A (Matsushita Electric Industrial Co., Ltd.), 27 October, 1995 (27.10.95), Par. Nos. [0010] to [0012]; Fig. 1 (Family: none)	1-9, 13-21
Y	Takashi YAMASHITA et al., 'Atsudensei SH Type Kyokaiha ni Kansuru Kento', The Institute of Electronics, Information and Communication Engineers Gijutsu Kenkyu Hokoku, 18 September, 1996 (18.09.96), Vol.96, No.249, pages 21 to 26	8, 9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search:
10 March, 2005 (10.03.05)

Date of mailing of the international search report:
29 March, 2005 (29.03.05)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/017929

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-323955 A (Murata Mfg. Co., Ltd.), 24 November, 2000 (24.11.00), Par. Nos. [0009], [0028] to [0029]; Fig. 6 & US 006437668 B1 & EP 001061646 A1 & CN 001273458 A & TW 000445710 B	8, 9
Y	JP 10-335974 A (Matsushita Electric Industrial Co., Ltd.), 18 December, 1998 (18.12.98), Par. No. [0005]; Fig. 1 (Family: none)	14, 15
A	JP 2002-152003 A (Murata Mfg. Co., Ltd.), 24 May, 2002 (24.05.02), Claims 2, 14; Par. Nos. [0016] to [0020], [0063] (Family: none)	10-12

A. 発明の属する分野の分類 (国際特許分類 (IPC)) Int. Cl ⁷ H03H9/26, 9/145		
B. 調査を行った分野 調査を行った最小限資料 (国際特許分類 (IPC)) Int. Cl ⁷ H03H3/08-3/10, 9/145, 9/25, 9/42-9/44, 9/64 9/68, 9/72, 9/76		
最小限資料以外の資料で調査を行った分野に含まれるもの 日本国実用新案公報 1932-1996年 日本国公開実用新案公報 1971-2004年 日本国登録実用新案公報 1994-2004年 日本国実用新案登録公報 1996-2004年		
国際調査で利用した電子データベース (データベースの名称、調査に使用した用語) JOIS on the web, [s 境界波]		
C. 関連すると認められる文献		
引用文献の カテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する 請求の範囲の番号
Y	WO 1998/052279 A1 (株式会社日立製作所) 1998. 11. 19 第2-3頁、第6-13頁、第2, 4-6, 12図 (ファミリーなし)	1-9, 13-21
Y	JP 7-283688 A (松下電器産業株式会社) 1995. 10. 27 【0010】-【0012】、図1 (ファミリーなし)	1-9, 13-21
<input checked="" type="checkbox"/> C欄の続きにも文献が列挙されている。 <input type="checkbox"/> パテントファミリーに関する別紙を参照。		
* 引用文献のカテゴリー 「A」特に関連のある文献ではなく、一般的技術水準を示すもの 「E」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの 「L」優先権主張に異議を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献 (理由を付す) 「O」口頭による開示、使用、展示等に言及する文献 「P」国際出願日前で、かつ優先権の主張の基礎となる出願		
の日の後に公表された文献 「T」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの 「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの 「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの 「&」同一パテントファミリー文献		
国際調査を完了した日 10. 03. 2005	国際調査報告の発送日 29. 3. 2005	
国際調査機関の名称及びあて先 日本国特許庁 (ISA/JP) 郵便番号100-8915 東京都千代田区霞が関三丁目4番3号	特許庁審査官 (権限のある職員) 江口 能弘	5W 3570
電話番号 03-3581-1101 内線 3574		

C (続き). 関連すると認められる文献		
引用文献の カテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する 請求の範囲の番号
Y	山下高志他, 圧電性SHタイプ境界波に関する検討, 電子情報通信学会技術研究報告, 1996. 09. 18, Vol. 96, No. 249, p. 21-26	8,9
Y	JP 2000-323955 A (株式会社村田製作所) 2000. 11. 24 【0009】, 【0028】 - 【0029】, 図6 &US 006437668 B1 &EP 001061646 A1 &CN 001273458 A &TW 000445710 B	8,9
Y	JP 10-335974 A (松下電器産業株式会社) 1998. 12. 18 【0005】, 図1 (ファミリーなし)	14,15
A	JP 2002-152003 A (株式会社村田製作所) 2002. 05. 24 請求項2, 14, 【0016】 - 【0020】, 【0063】 (ファミリーなし)	10-12

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/JP2004/017929

Box No. 1

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purpose of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/JP2004/017929

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	1-21	YES
	Claims		NO
Inventive step (IS)	Claims	10-12	YES
	Claims	1-9, 13-21	NO
Industrial applicability (IA)	Claims	1-21	YES
	Claims		NO
2. Citations and explanations:			
<p>Claims 1 to 3, 5, and 6</p> <p>Literature 1: WO 1998/052279 A1 (Hitachi Co., Ltd.)</p> <p>November 19, 1998</p> <p>pp. 2 to 3 and 6 to 13, and Figs. 2, 4 to 6, and 12</p> <p>In this literature, a boundary acoustic wave device (for example, one-aperture resonator) is disclosed which has a single crystal substrate, a solid layer and comb electrodes provided between the single crystal substrate and the solid layer and which is formed so as to prevent mechanical vibration energy primarily composed of an SH wave generated by the comb electrodes from leaking from the boundary described above.</p> <p>Literature 2: JP 7-283688 A (Matsushita Electric Industrial Co., Ltd.)</p> <p>October 27, 1995</p> <p>Paragraphs from [0010] to [0012], and Fig. 1</p> <p>In this literature, a surface acoustic wave device is disclosed in which when two resonators are provided on the same piezoelectric substrate, in order to make electromechanical coefficients of the two resonators different from each other, propagation directions of a surface acoustic wave of the resonators are made different from each other. In addition, it is also disclosed that by the structure as described above, the difference between a resonant frequency and an antiresonant frequency of one resonator is made different from that of the other resonator.</p> <p>A boundary acoustic wave device and a surface acoustic wave device are common in that electrical energy applied to the device is converted into mechanical energy.</p> <p>Hence, it can be readily conceived by a person skilled in the art that when two boundary acoustic wave resonators are provided on the same piezoelectric substrate, in order to make the electromechanical coefficients thereof different from each other, the invention described in the literature 2 is applied to the boundary acoustic wave device described in literature 1.</p> <p>Accordingly, Claims 1 to 3 cannot be considered to involve an inventive step.</p> <p>Claims 4 and 7</p> <p>From the description in the literature 2, it is apparent that, besides the resonators, for example, the same effect as described above can be obtained even when two longitudinally coupled filters are used. That is, it is apparent that when two longitudinally coupled filters are provided on the same piezoelectric substrate so as to make the propagation direction of a boundary acoustic wave of one filter different from that of the other filter, the electromechanical coefficients of the two longitudinally coupled filters can be made different from each other, and the bands thereof can also be made different from each other.</p> <p>Accordingly, Claims 4 and 7 cannot be considered to involve an inventive step.</p>			

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/JP2004/017929

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Claims 8 and 9

Literature 3: "Investigation of Piezoelectric SH type Boundary Acoustic Wave" authored by Takashi YAMASHITA et al.

Technical Report, Vol. 96, No. 249, Page 21-26, Sept. 18 1966, published by The Institute of Electronics, Information and Communication Engineers

In this literature, it is described that the acoustic velocity of a boundary acoustic wave must be lower than the acoustic velocity of a wave propagating through a solid layer and than the acoustic velocity of a wave propagating a piezoelectric substance.

Literature 4: JP 2000-323955 A (Murata Manufacturing Co., Ltd.)

November 24, 2000

Paragraphs [0009] and [0028] to [0029], and Fig. 6,
and US Patent No. 006437668 B1

In this literature, as a method for changing a resonant frequency of a surface acoustic wave resonator, it is disclosed that the electrode thickness or the duty ratio of the electrode is changed. This change corresponds to the change in acoustic velocity of a surface acoustic wave.

It can be readily conceived by a person skilled in the art that when the invention of the literature 2 is applied to the boundary acoustic wave device of the literature 1, in order to satisfy the existence condition of the boundary acoustic wave described in the literature 3, the electrode thickness or the duty ratio of the electrode is adjusted as described in the literature 4.

Accordingly, Claims 8 and 9 cannot be considered to involve an inventive step.

Claims 10 to 12

It has not been described in nor suggested by literatures listed in the international search report at all that when the density of an electrode is represented by ρ (kg/m³), the thickness of the electrode is represented by H (λ), and the wavelength of a boundary acoustic wave is represented by λ , $H > 8261.744\rho^{-1.576}$ is satisfied, $\rho > 3,745$ kg/m³ is satisfied, and $33,000.39050\rho^{-1.30533} < H < 88,818.90913\rho^{-1.24998}$ is satisfied.

Claim 13

In the literature 1, it is disclosed that a θ rotated Y-cut lithium niobate single crystal is used for a boundary acoustic wave device (in which, for example, $0 \leq \theta \leq 82$ is satisfied). This cut angle is overlapped with the range surrounded by points A1 to A13 of Table 1 in Claim 13.

Accordingly, Claim 13 cannot be considered to involve an inventive step.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/JP2004/017929

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Claims 14 and 15

Literature 5: JP 10-335974 A (Matsushita Electric Industrial Co., Ltd.)

December 18, 1998

Paragraph [0005], and Fig. 1

In this literature, it is disclosed that gold is used as a material for the comb electrodes of the boundary acoustic wave device. In addition, it is also disclosed that a protective layer is formed for this comb electrodes.

It can be readily conceived by a person skilled in the art that when the invention of the literature 2 is applied to the boundary acoustic wave device of the literature 1, gold is used as a material for forming the comb electrodes and the protective layer is provided for the comb electrodes as described in the literature 5.

Accordingly, Claims 14 and 15 cannot be considered to involve an inventive step.

Claims 16 to 20

In the literature 1, the boundary acoustic wave device is disclosed which is formed of a silicon oxide layer and a silicon layer laminated on a piezoelectric substrate.

Accordingly, Claims 16 to 20 cannot be considered to involve an inventive step.

Claim 21

In the literature 1, it is disclosed that in order to increase the reliability of the boundary acoustic wave device, a resin layer is provided on the solid layer.

Accordingly, Claims 21 cannot be considered to involve an inventive step.